REVERSIBLE IMAGE STEGANOGRAPHY USING ROI & RONI

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SUPERVISOR'S DECLARATION

I hereby declare that I have checked this thesis and in my opinion, this thesis is adequate in terms of scope and quality for the award of the degree of Bachelor Computer Science (Software Engineering)

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STUDENT'S DECLARATION

I hereby declare that the work in this thesis is based on my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at Universiti Malaysia Pahang or any other institutions.

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ABSTRAK

Reversible steganography dapat memulihkan imej asal tanpa ada penyelewengan apabila mesej rahsia tertanam telah diekstrak. Kajian ini telah diuji dengan empat imej yang berbeza dan satu storan imej. Imej sampel dibahagikan kepada tiga jenis rantau iaitu *Region of Interest (ROI), Region of Non-Interest (RONI)* dan rantau yang tak tersentuh. Penyelidikan ini menggunakan teknik mencari *ROI* dan *RONI* untuk mencari kedudukan untuk membenamkan mesej dan memulihkan imej asal. Semasa proses pembenaman, *bit RONI* disimpan ke dalam imej storan yang dikenali sebagai *sample_image*. Seterusnya, *bit ROI* disimpan ke *RONI* supaya ia dapat pulih semasa proses pengekstrakan. Pengirim memilih koordinat x dan koordinat y untuk membenamkan maklumat rahsia ke dalam *ROI2*. Pengirim juga perlu membenamkan kunci rahsia dalam imej *RONI2* yang boleh membantu untuk mendapatkan maklumat rahsia. Selepas itu, *stego*-imej dihasilkan selepas *ROI* dan *RONI* tertanam. Dalam proses pengekstrakan, penerima perlu mengekstrak kunci rahsia untuk menyahsulit mesej rahsia. Untuk proses balik, *ROI* dan *RONI* dibalikkan kepada *bit* asal. *Peak Signal-to-Noise Rasio (PSNR)* digunakan untuk mengukur kualiti *stego*-imej dan kesamaan imej asal dan memulihkan imej. Nilai *PSNR* daripada empat imej sampel terpilih adalah antara 52.60dB hingga 52.62dB. Histogram imej asal, *stego*-imej dan imej pulih dijana untuk perbezaan visual antara imej asal, *stego*-image dan memulihkan imej. Kesimpulannya, kaedah yang dicadangkan ini telah membuktikan pendekatan yang lebih baik berbanding dengan kerja sebelumnya dari segi memilih kedudukan untuk membenamkan dengan menggunakan *ROI* dan *RONI*.

ABSTRACT

Reversible steganography allows to recover of original image without any distortion when the embedded secret message has extracted. This research was tested with four different image and one storage image. The sample image is divided into three type of region which are Region of Interest (ROI), Region of Non-Interest (RONI) and untouchable region. This research using the technique of finding the ROI and RONI of the cover image to find position to embed the message and recover the original image. During embedding process, the RONIs' bits are stored into the storage image known as sample_image. Next, the ROIs' bits are stored into RONI so that it can be recovered during extraction process. Sender select the x-coordinate and y-coordinate to embed the secret information into the ROI2. Sender also need embed the secret key in the RONI2 image which can help to secure the secret information. After that, stego-image was generated after ROI and RONI embedded. In extraction process, receiver need to extract the secret key to decrypt the secret message. For reversible process, ROIs and RONIs were reversed to original bits. Peak Signal-to-Noise Ratio (PSNR) value was used to measure the quality of stego-image and similarity of original image and recover image. The value of PSNR of the four selected sample image is between 52.60dB to 52.62dB. Histogram of original image, stego-image and recover image are generated for visual difference between original image, stego-image and recover image. In conclusion, this proposed method has proved a better approach compared to previous work in terms of selecting a position to embed by using ROI and RONI.

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LIST OF ABBREVIATIONS

ASCII	American Standard Code for Information Interchange
bmp	Bitmap format file
dB	Decibels
DWT	Discrete Wavelet Transform
LSB	Least Significant Bit
MSE	Mean Squared Error
PSNR	Peak Signal-to-Noise Ratio
ROI	Region of Interest
RONI	Region of Non-Interest

CHAPTER 1

INTRODUCTION

1.1 Introduction

Steganography is a type of technique of hiding some information into a media such as video, text, audio and image. Steganography technique can let us use secret information communication to others. This technique allows us send hided an encrypted message inside another file to receiver so that can avoid detected, stolen, or destroyed by third party. Reversible steganography allows to recover of original image without any distortion when the embedded secret message has extracted. There are two types of reversible steganographic techniques which spatial domain and transform domain. In spatial domain, the Least Significant Bits (LSB) is the most common and simple approach for embedding message in a cover image. It is used the least significant bit of every pixel value in the image. Least Significant Bit is the simplest and easiest way of hiding information. In transform domain, it is a complex way to hide the information into the cover image compare with spatial domain. It transferred the cover image into another transformation and apply data hiding technique on it. There have two type methods in transform domain which Discrete Cosine Transformation (DCT) and Discrete Wavelet Transformation (DWT). DCT embeds the information by altering the transformed DCT co-efficient. DWT work by talking many wavelets to encode the image.

Steganography technique allow hiding information in the image. After embedded secret message into the image, we cannot recover the original image. Hence, we use reversible steganography technique which allows to extract hidden data and recover the original image.

1.2 Problem Statement

When using steganography technique, it will replace the stego-image to the original image. If delete the secret message from stego-image, it still cannot get back the original image. Therefore, steganography method needs to make sure are reversible and the original image can be used repeatedly.

Hence, technique on finding, hide secret information and recover original image on Region of Interest and Region of Non-Interest is proposed. This method prevents data hiding method are irreversible and user can recover the original image.

1.3 Objectives

i. To study current reversible image steganography technique.

ii. To propose reversible image steganography using LSB technique.

iii. To test the reversibility steganography technique to recover the original image.

1.4 Scope

i. Reversible Image Steganography technique only focuses on grayscale image.

ii. Demonstrate to ROI and RONI technique to recover original image.

iii. Test the reversibility steganography technique.

1.5 Significant

i. Sender and receiver can recover the original image on reversible image steganography technique.

ii. This research project help to improve the quality of original image.

iii. To help hiding some information into an image.

1.6 Thesis Organization

This project consists of five chapters. Chapter 1 is research introduction. Chapter 2 is a literature review. Chapter 3 is the methodology of this research. Chapter 4 is implementation, testing and result in discussion. Chapter 5 is the conclusion of this research.

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